

PATENT

Docket No.: FR000003

Customer No. 000024737

REMARKS

By this amendment, claims 1-4 and 7-8 have been amended. Claims 1-4 and 6-11 remain in the application. This application has been carefully considered in connection with the Examiner's Action to place the same in *prima facie* condition for allowance. Reconsideration and allowance of the application, as amended, is respectfully requested.

Rejection under 35 U.S.C. § 103**Claim 1**

Claim 1 recites an image processing method for providing three-dimensional geometric modeling of the spine, using a biplanar image reconstruction, comprising: acquiring a first digital view (F) of a part of the spine; acquiring a second digital view (L) of the same part of the spine taken from a different angle around the longitudinal axis of the spine, wherein each of the first and second digital views of the spine include a spine ribbon having a non-zero width and being substantially symmetrical with respect to a virtual axial line along an axis of vertebrae bodies of the spine in respective first and second digital views; drawing a real axial line (FAL, LAL) for each of the first and second digital views coinciding with the virtual axial line of the corresponding spine ribbon in a respective one of the first and second digital views, the real axial line being represented by a continuous line and wherein drawing the real axial line includes an operator using a control means to control a drawing program to digitally draw each real axial line (FAL,LAL) as a piece-wise linear curve drawn from a start point to an end point along an estimate of the virtual axial line of the corresponding spine ribbon; matching the dimensions of the digital views (F,L) from two predetermined corresponding landmarks (P1, P2) on each digital view set by the operator using the control means, wherein matching includes estimating a scale factor and a translation factor to make a system of coordinates for each digital view coincide, to provide a unique system of coordinates for the first and second digital views; performing a spline

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calculation to provide a smoothed axial line (FAC, LAC) on each digital view, the spline calculation including mathematical modeling of the operator drawn piece-wise linear curves of the first and second digital views for supplying respective new digital smoothed curves, the new digital smoothed curves being constructed with interpolated values provided between points of the respective piece-wise linear curves; and deriving three-dimensional coordinates (z, x, y) of corresponding points (P) along the spine as a function of the smoothed axial lines (FAC, LAC).

As described in the specification, the claimed embodiments provide a novel and non-obvious method of 3-D geometric modeling of the spine from a bi-planar image reconstruction not taught or suggested by the cited art. In diagnosing scoliosis, for example, the study of the particular deformation of each vertebra comes at an already advanced stage of a patient's follow-up or is applied to deformations limited to a given zone of the spine (see page 1, lines 28-29 and page 2, line 1). The present claimed embodiments provide for "a more primary diagnosis and relate to the global shape of the spine." The present embodiments also permit for quickly determining either that the deformity is local or that the deformity is global, and so might permit determining the breadth of the disease (see page 2, lines 1-3). Furthermore, the present claimed embodiments permit practitioners to easily obtain the required results of determining the 3-D location and the amplitude of the spine deformity at said location, the embodiments being usable by any operator or radiologist having no special skill in the field of drawing with computer means (see page 2, lines 22-28).

As amended and now presented, claim 1 more clearly defines and distinctly claims the subject matter that the applicant seeks to patent. Support for the amendment to claim 1 can be found in the specification and drawings, in at least the following: page 2, lines 27-28; page 3, lines 16-23, 31-32; page 4, lines 5-8; and Figures 1-3. Claims 2-4 and 7-8 have been amended for clarification.

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Claims 1-4, 6 and 7 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Andre et al., (hereinafter Andre), "Approach of the smoothing of three-dimensional reconstructions of the human spine using dual Kriging interpolation" in view of Aubin et al., (hereinafter Aubin), "Morphometric evaluations of personalized 3D reconstructions and geometric models of the human spine".

With respect to claim 1, Applicant traverses this rejection on the grounds that these references are defective in establishing a *prima facie* case of obviousness with respect to claim 1.

35 U.S.C. § 103 provides that:

A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ...
(Emphasis added)

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, neither Andre nor Aubin teaches or suggests "each of the first and second digital views of the spine include a **spine ribbon** having a non-zero width and being substantially symmetrical with respect to a **virtual axial line** along an axis of vertebrae bodies of the spine in respective first and second digital views" as is claimed in claim 1. As described in the specification on page 3, lines 14-21, each digital view of the claimed embodiment contains a spine ribbon having a non-zero width and which is substantially symmetrical with respect to a virtual axial line following the axis of the bodies of the vertebrae.

In addition, neither Andre nor Aubin teaches or suggests "drawing a **real axial line** (FAL, LAL) for each of the first and second digital views coinciding with the **virtual axial line** of the corresponding **spine ribbon** in a respective one of the first and second

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digital views, the real axial line being represented by a continuous line and wherein drawing the real axial line includes an operator using a control means to control a drawing program to digitally draw each real axial line (FAL,LAL) as a piece-wise linear curve drawn from a start point to an end point along an estimate of the virtual axial line of the corresponding spine ribbon" as is claimed in claim 1. In other words, the drawing of the real axial line is accomplished by an operator digitally drawing the real axial line along the virtual axial line of the corresponding spine ribbon as best as the operator may estimate (see specification, page 3, lines 22-23 and 28-32).

Furthermore, neither Andre nor Aubin teaches or suggests "matching the dimensions of the digital views (F,L) from two predetermined corresponding landmarks (P1, P2) on each digital view set by the operator using the control means, as is claimed in claim 1. That is, the landmarks on each digital view are set by the operator. Accordingly, it is impossible to render the subject matter of claim 1 as a whole obvious, and the explicit terms of the statute cannot be met.

Thus, a *prima facie* case of obviousness has clearly not been met, and the rejection of claim 1 under 35 U.S.C. §103 should be withdrawn.

With respect to claims 2-4, 6 and 7, this rejection is traversed for at least the reasons stated herein above with respect to claim 1. In addition, claims 2-4 depend from and add further limitation, in a patentable sense, to allowable claim 1. Accordingly, claims 2-4, 6 and 7 are believed allowable.

Claims 8-11 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Andre et al., (hereinafter Andre), "Approach of the smoothing of three-dimensional reconstructions of the human spine using dual Kriging interpolation" in view of Aubin et al., (hereinafter Aubin), "Morphometric evaluations of personalized 3D reconstructions and geometric models of the human spine" and Steiger et al. (U.S. 5,483,960), hereafter Steiger.

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With respect to claims 8-11, this rejection is traversed for at least the reasons stated herein above with respect to claim 1. In addition, claims 8-11 depend from and add further limitation, in a patentable sense, to allowable claim 1. Accordingly, claims 8-11 are believed allowable.

Conclusion

It is clear from all of the foregoing that independent claim 1 is in condition for allowance. Dependent claims 2-4 and 6-11 depend from and further limit independent claim 1 and therefore are allowable as well.

The amendments herein are fully supported by the original specification and drawing, therefore, no new matter is introduced.

An early formal notice of allowance of claims 1-4 and 6-11 is requested.

Respectfully submitted,



Michael J. Balconi-Lamica
Registration No. 34,291

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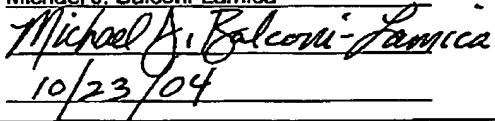
21004 Lakeshore Dr. W.
Spicewood, Texas 78669
Telephone: 512-461-2624
Facsimile: 512-264-3687
File: FR000003

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Michael J. Balconi-Lamica


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